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(54) Wireless remote control system for electrical devices

(57) A wireless remote control system for controlling electrical devices includes one or more RF transmittors and RF receivers. The RF receivers are installed along with the electrical device, such as a light fixture, is located and includes a receiver switch for controlling electrical power to the electrical device. RF transmitters are located where remote control switches are desired for the electrical devices to be controlled. The RF transmitters are activated by a transmitter switch, such as a push button or toggle switch or are automatically activated by, for example, a thermostat or an alarm system.

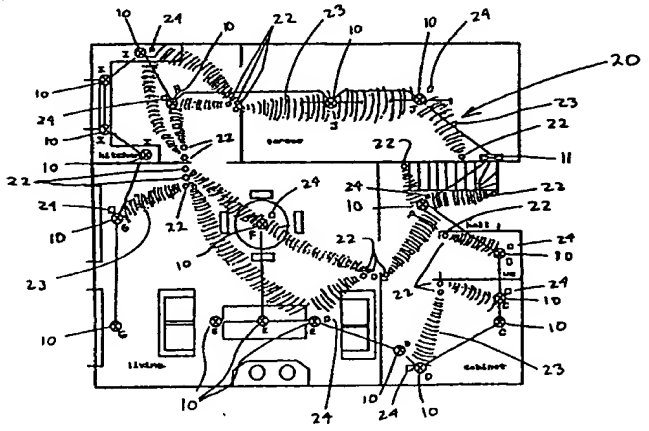

FIGURE 2

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Description

[0001] This application claims the benefit of United States Provisional Patent Application Serial No. 60/069,659 filed December 12, 1997.

BACKGROUND OF THE INVENTION

[0002] The field of the invention is controls for electrical devices.

[0003] Electrical devices such as light fixtures, air conditioners and other appliances are frequently controlled by one or more remotely located switches or other controls remotely located from the electrical devices. In some instances, one or more remotely located switches or other control devices also control electrical wall outlets where devices are plugged in for electrical power. In all of these situations, the remotely located switches or other remote controls are typically installed within a building's structure, such as the interior or exterior walls, and are physically hardwired into the particular circuit in the wiring system which supplies electric power to the device, or are otherwise connected via wiring to the device to be controlled. For example, when a building's electrical wiring is installed to service the building's various light fixture locations and light switches, additional wiring must also be installed and routed through each individual light switch installation at their remote locations.

[0004] Thus, in a typical residential or commercial building, wiring from the relatively high voltage main electrical power must be routed to each remote light switch location as well as to the particular light fixture location or electrical outlet controlled by the remote light switch. In such installations, once the light switch is installed, it is then limited to controlling only the particular light fixture location or other device or outlet to which it is wired.

[0005] The need for running electrical wire through conventional light switch installations greatly increases the costs and materials associated with electrical wiring installations. Moreover, the running of additional high voltage wiring through various walls in order to service light switches increases the fire dangers associated with electrical wiring. Thus, there is a need for an efficient and safe system for remotely controlling electrical devices such as light fixtures and other devices and/or wall outlets without the extra wiring required for remote switch installations such as wall mounted light switches.

SUMMARY OF THE INVENTION

[0006] To these ends a wireless remote control system eliminates the need for the unnecessary wiring used with conventional light switches and other remote switches. The wireless remote control system can be used to control a number of different electrical devices such as pumps, motors, heaters, lights and systems of light fixtures to name a few.

[0007] In a first aspect of the present invention, a wireless remote control system has a RF receiver located near the device to be controlled and electrically connected to the device and the electrical power supply to the device. The wireless remote control system also includes a RF transmitter remotely located from the RF receiver and the device to be controlled. The RF transmitter emits a RF signal that is receivable by the RF receiver. In response to the RF signal, the RF receiver activates a switch, which thereby controls the electrical power to the device to be controlled.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

FIG. 1 is a schematic view of a lighting system utilizing conventional wired remote switches.

FIG. 2 is a schematic view of a lighting system of FIG. 1, utilizing a preferred embodiment of the wireless remote control system.

FIG. 3 is a schematic view of a preferred conventional RF transmitter.

FIG. 4 is a schematic view of a preferred conventional RF receiver.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0009] Turning now in detail to the drawings, Figure 1 illustrates a conventional installation of electrical devices in a residential structure. The electrical devices to be remotely controlled in the conventional installation shown in Figure 1 are light fixtures 10. The means of remotely controlling light fixtures 10 is a series of conventional light switches 12 that are included in the electrical wining installation 14 of the residential structure. Figure 1 also illustrates various electrical wiring routes 16 that are necessitated by the use of conventional wired light switches 12. Electrical wiring routes 16 are unnecessary when a wireless remote controlled system 20 is utilized to control light fixtures 10.

[0010] Figure 2 illustrates a preferred embodiment of a wireless remote control system 20 used to control the same configuration of multiple light fixtures 10 depicted in Figure 1. It can be seen that wiring routes 16 shown in Figure 1 have been eliminated as unnecessary when the wireless remote control system 20 is used.

[0011] The preferred embodiment wireless remote control system 20 of Figure 2 is comprised of multiple RF transmitters 22 and RF receivers 24. With reference to Figures 2 and 3, RF transmitters 22 can be advantageously mounted within the walls 28 of the residential structure at locations where remote control switches 26 are desired. Each RF transmitter 22 is a compact unit having a conventional RF signal emitter operating preferably in a FM band within the range of 400 MHz-900

MHz. Preferably, each RF transmitter 22 in wireless remote control system 20 uses the same frequency band. The selection of a particular frequency band for the wireless remote control system 20 depends on the geographical area where the system is to be used and the availability of frequency bands in that area. A preferred system for Europe operates in the 430 MHz band at 433.32 MHz.

[0012] An example of a preferred RF transmitter 22 is shown in schematic form in Figure 3. RF transmitter 22 is preferably operated at a relatively low voltage and can be battery powered using, for example, a pair of N-size 1.5 V battery cells. Other low voltages are possible. The power associated with operating RF transmitter 22 is thus very low. Because of the relatively low voltage (for example, 1.5 V) and low power of RF transmitter 22, the resulting electrical current is extremely low, in the microamp range. As a result, the risk of sparks at RF transmitter 22 is greatly reduced or even eliminated, which greatly reduces the fire risk from present system.

[0013] In a preferred embodiment, each RF transmitter 22 is activated by a transmitter switch 26 which is preferably wall mounted along with RF transmitter 22 and effectively replaces the conventional wall mounted push button or toggle switches 12 presently used in many conventional installations, such as the lighting system shown in Figure 1. RF transmitter 22 can be advantageously mounted within the wall 28 and behind the transmitter switch 26. In a preferred embodiment, the transmitter switch 26 is a push button type. Transmitter switch 26 can also be a toggle switch or other type of conventional switch, including, for example, a thermostat controlled switch or a switch activated by an alarm system. A thermostat-controlled switch could be used to control, for example, an air conditioning device or a heating device.

[0014] RF transmitter 22 can effectively emit a RF signal 23 through non-ferro obstacles such as walls, panels, ceilings, and the like. The range of a preferred conventional RF transmitter 22 is about thirty (30) meters in an open space.

[0015] The RF signal 23 emitted by RF transmitter 22 is received by RF receiver 24. An example of a preferred RF receiver 24 is shown in Figure 4. In a preferred embodiment, RF receiver 24 is a compact unit and is mounted within a wall or ceiling 30 at or near the location of the device to be remotely controlled, such as a light fixture 10 or an electrical outlet. In a preferred embodiment, RF receiver 24 receives power from the main electrical power (e.g., 110 Volts AC) and is connected in the electrical circuit 25 to the light fixture 10 or outlet to be remotely controlled.

[0016] RF receiver 24 preferably comprises a relatively lower voltage component 32, operating at about 12 Volts, and a higher voltage component 34, operating at the main electrical voltage of the house or structure (about 220 V to 240 V in Europe or about 100 V to 140 V in the United States). Lower voltage component 32 comprises the conventional electronic RF receiver components associated with the receiving of RF signal 23.

[0017] Higher voltage component 34 of the RF receiver 24 is comprised of receiver switch 36 that controls the electric power to light fixture 10 or other device to be controlled. Higher voltage component 34 of RF receiver 24 can be advantageously contained in a small sealed case 38. Sealed case 38 is preferably made of a hard and fire resistant plastic-type material which serves to seal the higher voltage component 34, including receiver switch 36, from the outside environment and to galvanically separate higher voltage component 34 from the electronic RF receiving components of lower voltage component 32. Sealed case 38 allows RF receiver 24 to be installed outdoors or in very humid or wet environments, such as bathroom light fixtures, without the risk of electrical shorts or sparks from receiver switch 36. Sealing receiver switch 36 within sealed case 38 thus results in enhanced safety from fire when the present remote control system 20 is utilized.

[0018] In response to RF signal 23 emitted by RF transmitter 22, RF receiver 24 activates receiver switch 36, which switches on or off the electrical power to light fixture 10 or to the electrical outlet or other device to which it is connected. Alternatively, RF receiver 24 can also be used to variably control the electric power of a device to which it is connected by varying the electrical resistance in response to the RF signal 23 received from the RF transmitter 22.

[0019] In a preferred embodiment, RF receiver 24 is programmable and can be automatically programmed to respond to a particular RF signal 23 from a particular RF transmitter 22. In this embodiment, RF transmitter 22 is provided with one or more conventional on/off DIP switches which can be configured to permit the control of a large number of different light fixtures or other devices with a single remote control system operating within a single frequency band. For example, when there are six (6) DIP switches, there are 64 different codes or addresses that can be set depending on the on/off combinations of the DIP switches. Each combination of DIP switch settings represents a unique code or address that can correspond to a particular light fixture 10 or set of light fixtures to be controlled.

[0020] RF transmitter 22 can also have multiple channels, with each channel having its own set of DIP switches. In this manner, a single RF transmitter 22 can control multiple sets of light fixtures 10 or other devices through RF receivers 24 programmed to the appropriate codes or addresses. Figure 3 depicts one channel and two channel RF transmitters 22.

[0021] When RF receiver 24 is automatically programmable, it is probed by setting it to a set/reset mode and emitting a RF signal 23 from the particular RF transmitter 22 desired to control that RF receiver 24. Once the RF receiver 24 responds to the RF signal 23, it is then programmed to thereafter respond only to RF transmitters 23 with the same code or address (i.e. the same

DIP switch settings).

[0022] In an alternate preferred embodiment, both RF transmitter 22 and RF receiver 24 are provided with one or more conventional on/off DIP switches to permit the individual control of a multiple light fixtures or other devices with a single remote control system operating within a single frequency band. In this embodiment, the DIP switches on a particular RF transmitter 22 are set to correspond with the DIP switch settings on a particular RF receiver 24. As before, each combination of DIP switch settings represents a unique code or address that can correspond to a particular light fixture 10 or set of light fixtures to be controlled.

[0023] In the preferred embodiment shown in Figure 2, wireless remote control system 20 operates multiple sets of light fixtures 10 on different electrical circuits. These circuits are shown as 10-A, 10B, 10-C and so on. The wireless control of light fixtures 10 or other electrical devices on different electrical circuits by separate RF transmitters 22 operating on a single frequency band is achieved by programming RF receivers 24 to respond to the desired RF transmitters 22 or, alternatively, by setting the DIP switches on RF receivers 24 and RF transmitters 22 such that the desired light fixtures 10 or circuits are controlled by a desired remote transmitter switch 26.

[0024] As shown in Figure 2, for any particular circuit which may have one or more light fixture 10 or other device, there need be only one RF receiver 24 which can control the power to that circuit. Once wireless remote control system 20 is installed, if an additional light switch location is desired, one can simply install an additional RF transmitter 22 and transmitter switch 26 and set the DIP switches on the new RF transmitter 22 to correspond to the programming or the DIP switch settings on a particular RF receiver 24 on the circuit to be controlled. The DIP switches can also be easily reconfigured by a user of the system to change the light fixtures to be controlled by an existing transmitter switch 26. Additionally, existing transmitter switch 26 and RF transmitter 22 placements can easily be moved without the need for changing the electrical wiring of the structure.

[0025] Thus, a wireless remote control system utilizing existing conventional components has been disclosed. When used, the system reduces the cost and complexity of wiring installations while improving fire safety. Moreover, the system is easy to use and install and is flexible so that changes can be easily made to reprogram the switches to control different electrical devices. While embodiments and applications of this invention have been shown and described, it would be apparent to those skilled in the art that many more modifications and substitutions of known equivalents are possible without departing from the scope of the invention. The invention, therefore, is not to be restricted except in the spirit of the appended claims.

Claims

1. A wireless remote control system for controlling electrical devices, comprised of:

   a RF receiver which is installed within a building structure and which is connected to an electrical device, the RF receiver also being connected to an electrical power source for supplying electrical power to the electrical device, the RF receiver having a means for receiving a RF signal and a receiver switch whereby the receiver switch controls the electrical power supplied to the electrical device in response to the RF receiver receiving a RF signal;

   a RF transmitter remotely located from the RF receiver and which is capable of transmitting a RF signal that is receivable by the RF receiver; and

   a transmitter switch device capable of activating the RF transmitter.

2. The wireless remote control system for controlling electrical devices of claim 1, wherein the transmitter switch device is a wall mounted light switch and the RF transmitter is installed within a wall structure behind the transmitter switch device.

3. The wireless remote control system for controlling electrical devices of claim 1 or 8, wherein the RF transmitter and the RF receiver each can be programmed with an adjustable code whereby the RF receiver will only respond to the RF signal from the RF transmitter if the RF transmitter and RF receiver are programmed with the same code.

4. The wireless remote control system for controlling electrical devices of claim 3, wherein the RF transmitter has a plurality of transmit channels and each channel can be programmed with a separate ajustable code.

5. The wireless remote control system for controlling electrical devices of claim 3, wherein the adjustable code on the RF transmitter and the RF receiver is programmed using one or more DIP switches on the RF transmitter and the RF receiver.

6. The wireless remote control system for controlling electrical devices of claim 1, wherein the RF receiver is comprised of a higher voltage component operating at the voltage of the main electrical power supply of the building, and a lower voltage component, wherein the higher voltage component is contained within a sealed case and is comprised of the receiver switch, and the lower voltage component is comprised of the means for receiving the RF

signal.

7. The wireless remote control system for controlling electrical devices of claim 1 or 8, wherein the transmitter switch device is a thermostat controlled switch or controlled by an alarm system.

8. A wireless remote control system for controlling electrical devices, comprised of:

a RF receiver which is installed within a building structure and which is connected to an electrical device, the RF receiver also being connected to an electrical power source for supplying electrical power to the electrical device, the RF receiver having a means for receiving a RF signal and a receiver switch whereby the receiver switch controls the electrical power supplied to the electrical device in response to the RF receiver receiving a RF signal;
a RF transmitter which is installed within the building structure at a location remote from the RF receiver, and which is capable of transmitting a RF signal that is receviable by the RF receiver; and a transmitter switch device capable of activating the RF transmitter.

9. The wireless remote control system for controlling electrical devices of claim 8, wherein the RF receiver is comprised of a higher voltage component operating at the voltage of the main electrical power supply of the building, and a lower voltage component, wherein the higher voltage component is comprised of the receiver switch, and the lower voltage component is comprised of the means for receiving the RF signal.

10. A wireless remote control system for controlling electrical devices, comprised of:

a plurality of RF receivers which are installed within a building structure wherein each RF receiver is connected to an electrical device and an electrical power source for supplying electrical power to the electrical device, the RF receivers each having a means for receiving a RF signal and a receiver switch whereby the receiver switch controls the electrical power supplied to the electrical device in response to the RF receiver receiving a RF signal;
a plurality of RF transmitters which are installed within the building structure at locations remote from the plurality of RF receivers, wherein the RF transmitters are capable of transmitting RF signals that are receivable by one or more of the plurality of RF receivers, and wherein each of the RF transmitters has a transmitter switch device installed along with the RF transmitter and which is capable of activating the RF transmitter; and
wherein the RF transmitters and the RF receivers each can be programmed with an adjustable code whereby the RF receivers will only respond to the RF signals from the RF transmitters if the RF transmitters and RF receivers are programmed with the same code.

11. The wireless remote control system for controlling electrical devices of claim 10, wherein the transmitter switch devices are wall mounted light switches and the RF transmitters are installed within wall structures behind the transmitter switch devices.

12. The wireless remote control system for controlling electrical devices of claim 10, wherein the adjustable code on the RF transmitters and the RF receivers is programmed using one or more DIP switches on the RF transmitters and the RF receivers.

13. The wireless remote control system for controlling electrical devices of claim 10, wherein each of the RF receivers are comprised of a higher voltage component operating at the voltage of the main electrical power supply of the building, and a lower voltage component, wherein the higher voltage component is contained within a sealed case and is comprised of the receiver switch, and the lower voltage component is comprised of the means for receiving the RF signal.

14. The wireless remote control systsem for controlling electrical devices of claim 10, wherein at least one of the transmitter switch devices is a thermostat controlled switch or controlled by an alarm system.

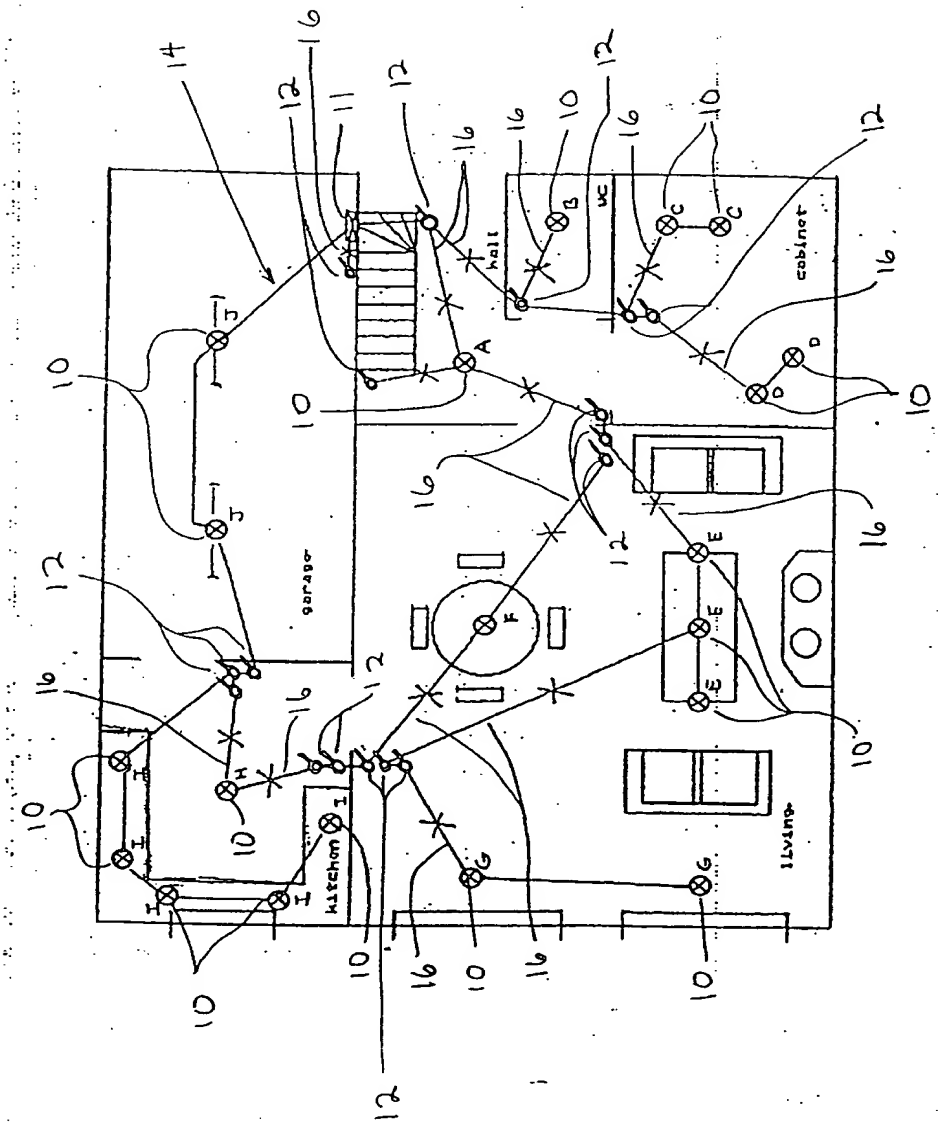

FIGURE 1

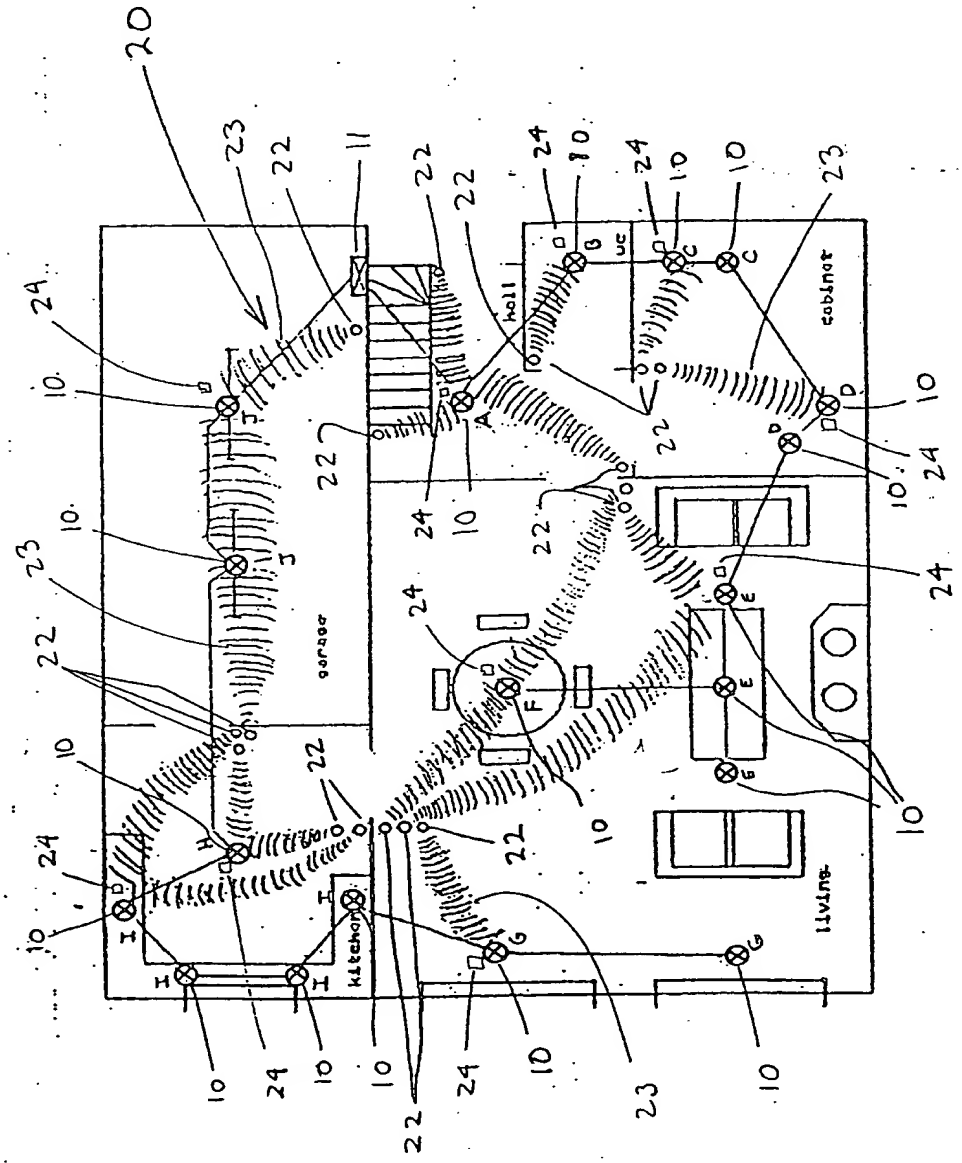

FIGURE 2

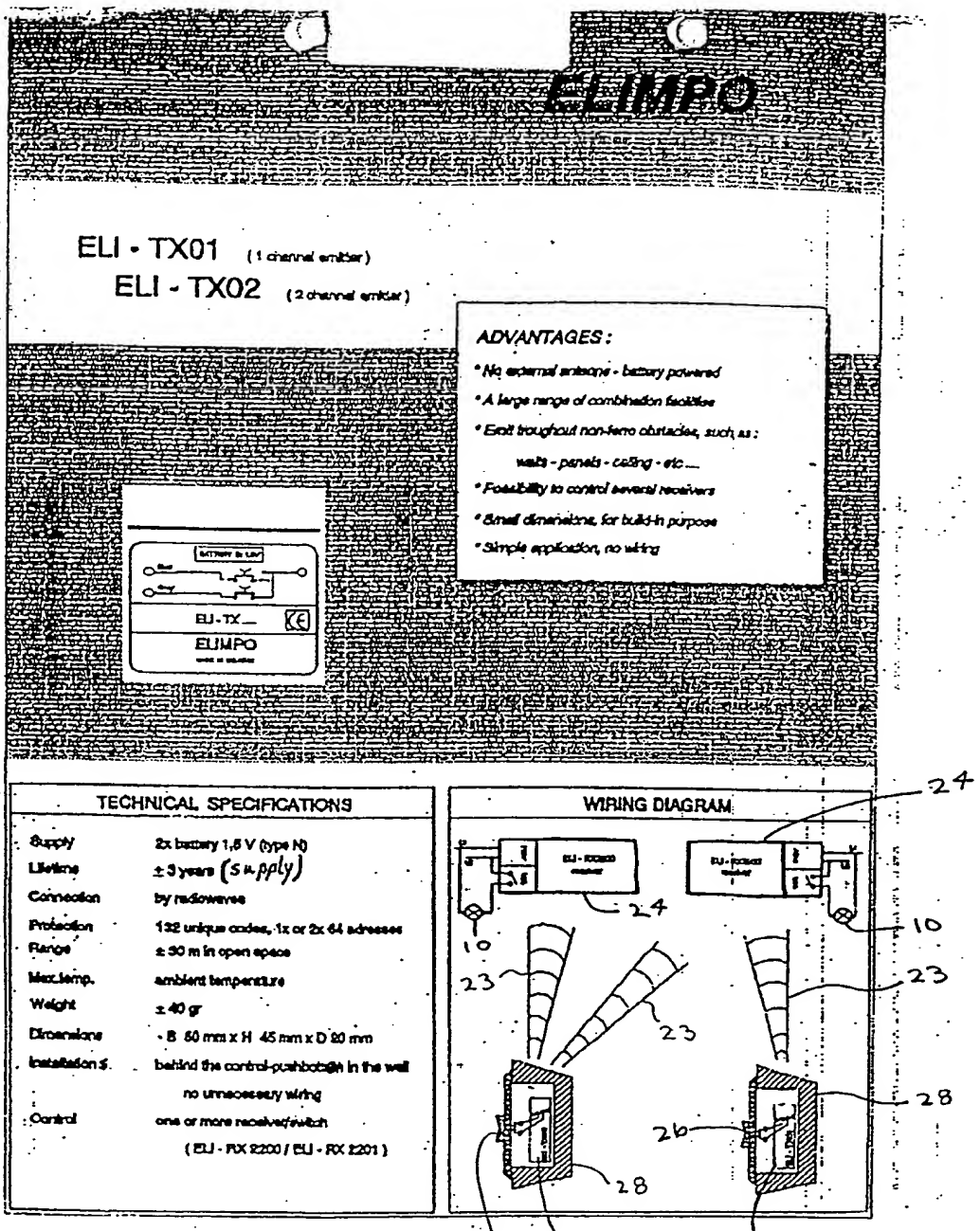
ELIMPO
ELI - TX01 (1 channel emitter)
ELI - TX02 (2 channel emitter)
ADVANTAGES :
* No external antenne - battery powered
* A large range of combination facilities
* Exist troughout non-ferro obstacles, such as :
walls - panels - ceiling - etc....
* Possibility to control several receivers
* Small dimensions, for build-in purpose
* Simple application, no wiring
ELI-TX...
ELIMPO
TECHNICAL SPECIFICATIONS
Supply 2x battery 1,5 V (type N)
Lifetime ± 3 years (supply)
Connection by radiowaves
Protection 132 unique codes, 1x or 2x 64 adresses
Range ± 30 m in open space
Max.temp. ambient temperature
Weight ± 40 gr
Dimensions - B 50 mm x H 45 mm x D 20 mm
Installation s. behind the control-pushbotton in the wall
no unnecessary wiring
Control one or more receiver/switch
(ELI - RX 2200 / ELI - RX 2201)
WIRING DIAGRAM
24
10
23
28
26
22

FIGURE 3

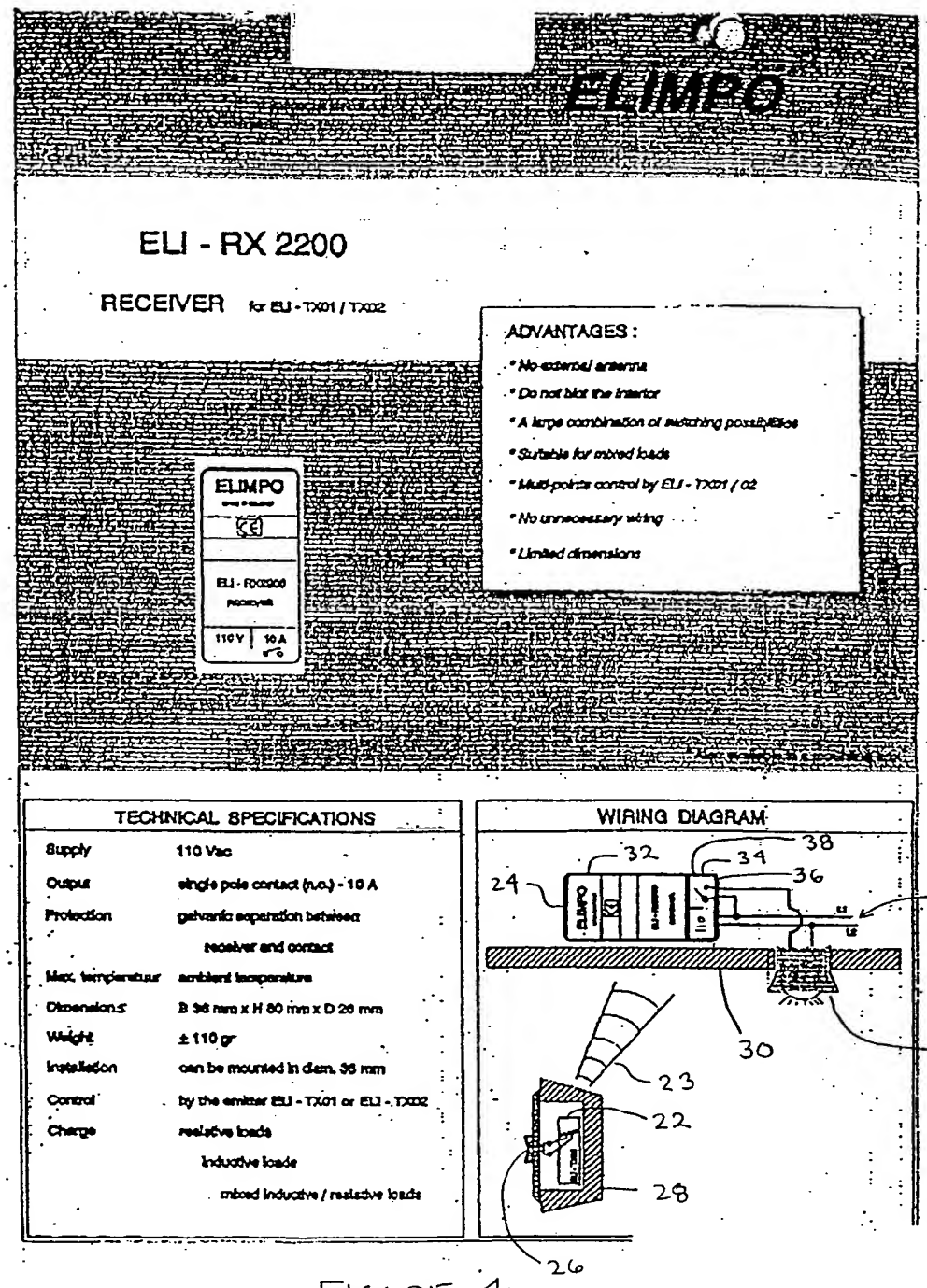
ELIMPO
ELI - RX 2200
RECEIVER for ELI - TX01 / TX02
ADVANTAGES :
* No external antenna
* Do not blot the interior
* A large combination of switching possibilities
* Suitable for mixed loads
* Multi-points control by ELI - TX01 / 02
* No unnecessary wiring
* Limited dimensions
ELIMPO
ELI - RX2200
110 V
10 A
TECHNICAL SPECIFICATIONS
Supply 110 Vac
Output single pole contact (n.o.) - 10 A
Protection galvanic separation between receiver and contact
Max. temperature ambient temperature
Dimensions B 36 mm x H 80 mm x D 26 mm
Weight ± 110 gr
Installation can be mounted in diam. 36 mm
Control by the emitter ELI - TX01 or ELI - TX02
Charge resistive loads
inductive loads
mixed inductive / resistive loads
WIRING DIAGRAM
32
34
38
36
24
25
30
10
23
22
28
26

FIGURE 4

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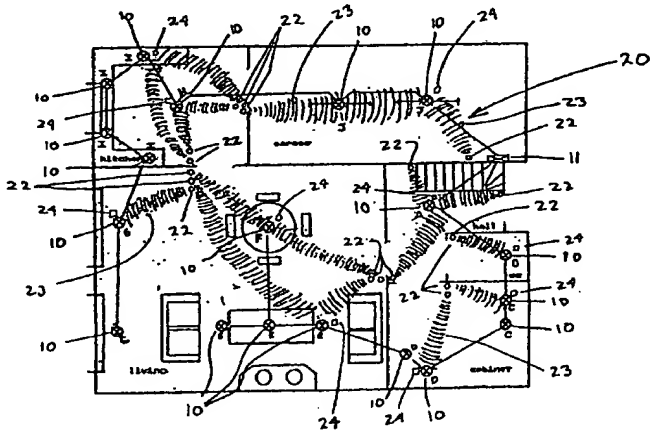

FIGURE 2

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European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 12 3245

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 4 995 053 A (CHANDLER DONALD G ET AL) 19 February 1991 (1991-02-19) * column 14, line 9 - line 52 * * column 20, line 34 - line 46 * * column 29, line 29 - column 30, line 63 *	1-3,6, 8-11,13	H02J13/00
X	EP 0 610 532 A (CONADD SRL) 17 August 1994 (1994-08-17) * column 1, line 37 - column 2, line 17 * * column 2, line 36 - column 4, line 10 *	1-4,6, 8-11,13	
A	WO 95 24759 A (PARK HYUNG SIK) 14 September 1995 (1995-09-14) * page 7, line 13 - page 10, line 24 *	1-14	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6) H02J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14 July 2000	López-Pérez, M-C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
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L : document cited for other reasons

& : member of the same patent family, corresponding document

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 98 12 3245

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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14-07-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4995053 A	19-02-1991	US 4864588 A	05-09-1989
		US 4932037 A	05-06-1990
		AU 1360688 A	14-09-1988
		EP 0346374 A	20-12-1989
		JP 2503860 T	08-11-1990
		WO 8806365 A	25-08-1988
EP 0610532 A	17-08-1994	NONE	
WO 9524759 A	14-09-1995	KR 163940 B	20-03-1999
		AU 1961595 A	25-09-1995
		AU 6386094 A	08-11-1994
		AU 8004994 A	25-09-1995
		BR 9406506 A	09-01-1996
		CA 2161102 A,C	27-10-1994
		CA 2185213 A	14-09-1995
		CN 1121382 A,B	24-04-1996
		CN 1144576 A	05-03-1997
		EP 0695476 A	07-02-1996
		EP 0749642 A	27-12-1996
		JP 8506709 T	16-07-1996
		JP 10500556 T	13-01-1998
		WO 9424756 A	27-10-1994
		WO 9524758 A	14-09-1995
		US 5717258 A	10-02-1998

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